

# Impact of camel transportation on pastoralist livelihoods in Ethiopia

Findings from Berahle woreda, Afar Regional State

---

Selamawit Teklu Araya

Country Report

April 2015

---

**Drylands and pastoralism**

---

*Keywords:*

Drylands, pastoralism, economic resilience, camel, transportation, livelihoods



Feinstein  
International Center

Tufts  
UNIVERSITY

Gerald J. and Dorothy R.  
Friedman School of  
Nutrition Science and Policy



## About the authors

Selamawit Teklu Araya  
Masters degree candidate in economics, specialising in  
development policy analysis  
College of Business and Economics  
Mekelle University  
Mekelle, Tigray, Ethiopia  
selitek33@gmail.com  
+251923309334

## Produced by IIED's Climate Change Group

The Climate Change Group works with partners to help secure fair and equitable solutions to climate change by combining appropriate support for adaptation by the poor in low- and middle-income countries, with ambitious and practical mitigation targets.

The work of the Climate Change Group focuses on achieving the following objectives:

- Supporting public planning processes in delivering climate resilient development outcomes for the poorest.
- Supporting climate change negotiators from poor and vulnerable countries for equitable, balanced and multilateral solutions to climate change.
- Building capacity to act on the implications of changing ecology and economics for equitable and climate resilient development in the drylands.

## Acknowledgements

The synthesis of research was guided by Saverio Krätli as a consultant for IIED and facilitated by Eshetu Yimer at Tufts University. The report was reviewed by Caroline King-Okumu at IIED and edited by Lucy Southwood.

## Partner organisations

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them – from village councils to international conventions.

The Feinstein International Center of the Tufts University Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy develop and promote operational and policy responses to protect and strengthen the lives and livelihoods of people living in crisis-affected and marginalized communities who are impacted by violence, malnutrition, loss of assets or forced migration. Through publications, seminars, and confidential evidence-based briefings, the Feinstein International Center seeks to influence the making and application of policy in the countries affected by crises and in those states in a position to influence such crises. The Center works globally in partnership with national and international organizations to bring about institutional changes that enhance effective policy reform and promote best practice. The Center seeks to combine academic excellence, innovative research and public policy development.

Published by IIED, April 2015

Selamawit Teklu Araya. 2015. *Impact of camel transportation on pastoralist livelihoods in Ethiopia: Findings from Berahle woreda, Afar Regional State*. IIED Country Report. IIED, London.

<http://pubs.iied.org/10127IIED>

ISBN: 978-1-78431-156-8

International Institute for Environment and Development  
80-86 Gray's Inn Road, London WC1X 8NH, UK  
Tel: +44 (0)20 3463 7399  
Fax: +44 (0)20 3514 9055  
email: [info@iied.org](mailto:info@iied.org)  
[www.iied.org](http://www.iied.org)

 @iied

 [www.facebook.com/thelIIED](http://www.facebook.com/thelIIED)

Download more publications at [www.iied.org/pubs](http://www.iied.org/pubs)

This is one of a series of reports synthesising the findings of field research conducted by masters' degree students at Ethiopian universities who investigated the contribution of pastoral production to the national economy. The students developed the research to complement their degree studies, with support from the International Institute for Environment and Development and Tufts University.

## Contents

<b>Glossary</b>	<b>2</b>	<b>3 Results</b>	<b>13</b>
<b>Executive summary</b>	<b>3</b>	3.1 Contribution to the national economy	14
<b>1 Introduction</b>	<b>4</b>	3.2 Employment in camel salt transportation	14
<b>2 Methodology of the study</b>	<b>6</b>	3.3 Total profits in the salt trade value chain	15
2.1 Description of the study area	7	3.4 Returns from the camel salt transportation service	15
2.2 Data sources and types	8	3.5 Factors affecting household decisions	16
2.3 Sampling procedure and sample size	8	<b>4 Discussion and recommendations</b>	<b>18</b>
2.4 Statistical analysis	8	<b>5 Conclusions</b>	<b>20</b>
2.5 Econometric analysis	8	<b>References</b>	<b>22</b>
		<b>Related reading</b>	<b>23</b>

# Glossary

<b>asbo</b>	type of salt mined in Berhale woreda
<b>ankerabi</b>	medium salt block
<b>birr</b>	Ethiopian currency. Exchange rate US\$1=18.81 birr from October 2013 (www.oanda.com) can be applied to all costs mentioned in this report.
<b>daka</b>	measure used for fodder, 1 daka=10kg
<b>geleo</b>	large salt block
<b>kebele</b>	The smallest administrative unit in Ethiopia. It is part of a <b>woreda</b> , which in turn is part of a zone, which is part of a region.
<b>kushet</b>	village
<b>gerewenya</b>	small salt block
<b>woreda</b>	A third-level administrative division in Ethiopia. A district

# Executive summary

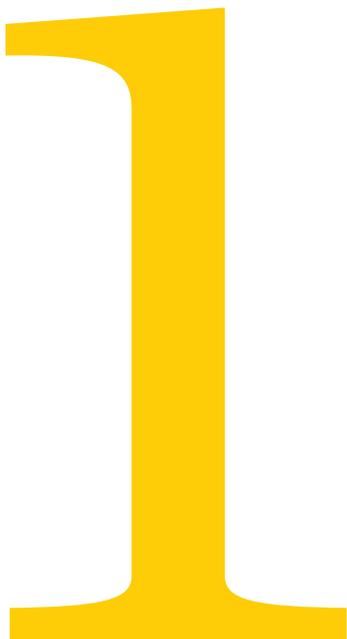
The main objective of this study is to assess the impact of camel salt transportation on the livelihoods of pastoralists in Berahle woreda, Afar Regional State of Ethiopia and to identify the sector's contributions to the national economy in terms of employment and tax revenues. To do this, we collected primary data from 250 sample households (115 camel owners and 135 camel non-owners) and analysed it using statistical and econometric techniques.

The study found that the camel salt transportation service creates full-time jobs for about 8,774 individuals and contributes around 12,480,000 birr (about US\$663,000) a year to government revenue in the form of salt tax. This demonstrates the importance of salt in general, and the camel salt transportation service in particular, to the economy of the country. But many camel-owning households observed a decrease in the number and productivity of camels as a result of drought, disease and rustling when travelling through insecure areas.

Our study demonstrates that, for the salt value chain to function, camel transporters have to take many risks and meet expenses on top of purchasing and feeding their camels. Transporters have to pay the salt miners, salt shapers and the daily workers who offload the salt from camels. They also absorb the cost of any accidents during the transportation process. When camel owners rent their camels to other transporters, they are acting as a credit granting institution, increasing their risk levels and halving their profits.

Any national policy or development intervention aimed at improving the livelihoods of pastoral societies in the Afar region should take into account the social and economic contribution of camels, particularly as a form of transportation. Our study observed that camel transporters face a number of challenges, including regional security problems, camel health issues and access to credit to build up their herds. Government interventions that succeed in addressing these constraints could further increase the contribution made by the camel salt transportation sector to the national economy and local livelihoods.

# Introduction



Camels, also known as ships of the desert, are large, strong and hard working. Despite the introduction of motorised transportation, these animals remain an important means of transportation, providing a cheap and reliable alternative for short, medium and long-distance transport of many kinds of goods such as grain, salt, domestic water and fuel, household tools and animal feed. They carry heavy loads to remote and inaccessible places where transportation vehicles cannot go (Schwartz 1988, Heanving and Zhongmin nd). In regions that are arid and hot during the day and cold at night, they withstand climatic conditions that no other domestic animal can survive. In times of water scarcity, they can endure without water for more than two weeks. In the arid and semi-arid areas of Ethiopia, the dromedary camel is highly valued and provides social standing for its owner.

Ethiopia's Afar Regional State (referred to in this paper as Afar region), is one of the country's four major pastoral regional states and is in the northeast. Camels are well suited to the region's arid desert areas. The region accounts for about 22.5 per cent of the country's total camel population (Sintayehu *et al.* 2010). Camels represent the nomadic capital wealth of Afar society and are essentially raised and kept for this reason (Guinand 2000). They are used to transport salt, one of the region's major minerals, from the mines to the marketplace, providing an income for camel-owning pastoralists and others in the salt trade chain.

Although camels are the main means for transporting salt in Afar, there is a lack of understanding around the economic contribution and significance this service provides. No well documented empirical study has explored the contribution of the camel salt transportation

service to the national economy in general, or its impact on the livelihoods of the camel owners in particular. This paper presents a synthesis and discussion of key findings from a masters' degree research project in the College of Business and Economics, Mekelle University, Ethiopia (Araya 2014). We collected the data from the field between 19 September and 27 October 2013. The study aims to improve understanding of the important economic contribution the camel transportation service makes in Berahle woreda (district), to individual and the public purse. The research took place with support from the International Institute for Environment and Development (IIED) and Tufts University.

We hope that the synthesis we present in this paper will provide guidance to policymakers who are interested in how best to enable economic growth and development in the Afar region, maximising the contribution from pastoralism, and from camel transportation activities in particular.

Our overall objective is to investigate the impact of the salt transportation activity on local livelihoods and the wider economy. The specific objectives included:

- investigating the contribution of camel salt transportation activities to the national economy through government revenue and employment
- assessing the effects of participating in the salt transportation sector on the livelihoods of camel-owning households, and
- identifying factors that affect pastoralists' participation in the camel rent business and their decisions to buy or rent camels.

# Methodology of the study

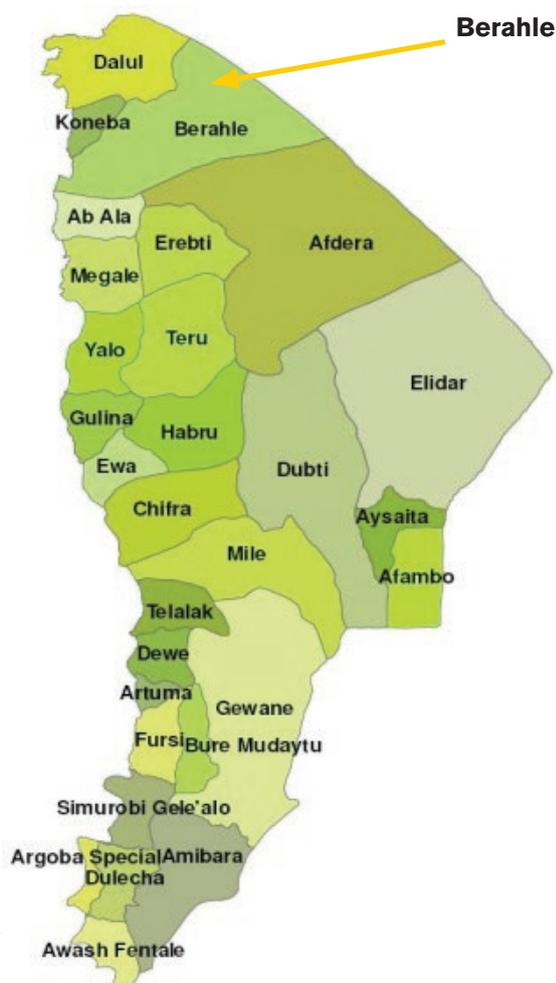


## 2.1 Description of the study area

The Afar region in northeast Ethiopia is subdivided into five administrative zones and of 29 *woredas* (districts), all of which are pastoral. Because much of the land is dry, rocky and unsuitable for crop cultivation, people depend mainly on livestock production for their livelihoods.

Our study took place in Berahle woreda, in the northeastern part of Afar. It is part of Administrative Zone 2 and its territory includes part of the Afar Depression. The woreda's major body of water is the saline Lake Karum (also known as Lake Assela). Mining is the main industry here; the best known resource extracted is salt. According to the 2007 Census conducted by the Central Statistical Agency of Ethiopia, Berahle woreda has a total population of 78,881 people, of which 99 per cent are Muslim.

Figure 1. Location map of the study area



Sabanna-Demalie is one of Berahle woreda's nine kebeles. It has a salt mine which is found in the Assaele area. Assaele is 75km from the woreda's market centre, Berhale kebele. The salt extracted here, particularly the shaped salt block which is supplied to market, is locally known as *asbo*. The salt blocks transported from the area come in three different sizes: small (*gereweyna*), medium (*ankerabi*) and large (*geleo*).

More than 99 per cent of working camels in Berahle woreda are engaged in salt transportation. Most, but not all, the camel-owning pastoral households are engaged in this activity. If camels are not used by their owners for salt transportation, they may rent them out for this purpose. In these cases, the two parties share the costs equally. However, in the case of an unexpected accident during transportation (such as camel death), the camel owner bears the loss and the transporter pays nothing. The salt transporter only has to provide evidence that the camel died and was not sold. The evidence could be an eyewitness or one part of the camel's body.

When a camel owner rents out camels to other salt transporters, the agreement between the camel owner and the transporter usually includes three successive salt transporting trips. The transporter takes the income from the first trip, the owner the second, and they share the income from the third trip equally. So camel owners can earn half the total income from the salt trade as a result of the value of their camels' transportation service. After the three trips are completed, if the two parties wish to, they can repeat the process.

The average total number of days spent transporting, loading and selling the salt is five days. The camels used vary in size and age, and are usually categorised into three groups: adult, medium and young camels. They are expected to exert the same level of physical effort regardless of the size of salt blocks they carry. Although the number and size of salt blocks loaded onto the carriage varies, the total weight in kilograms is usually similar. The biggest salt blocks weigh about 7kg. A young camel can carry an average of 12 of the biggest salt blocks (84kg); a medium camel can carry 16 (112kg) and an adult 22 (154 kg).

Salt transporters usually take a minimum of four camels on each trip to the salt mining area. This is considered the threshold for profitability and ensures they can transport enough salt. If a household has less than four camels, they can either rent them to other salt transporters and receive a share of the profits, or rent additional camels to transport the salt themselves. If they rent camels, they receive all of the profits from the loads carried by their own camels and a share of the profits generated by the rented camels.

## 2.2 Data sources and types

We used a structured questionnaire to collect the primary data through face-to-face interviews with individuals from selected sample households in the target area. We also made direct observations and held focus group discussions. We collected the primary data in October 2013. This was complemented with available secondary data.

## 2.3 Sampling procedure and sample size

We selected the sample households using a multistage sampling technique. Berahle woreda was purposely selected from all *woredas* of the zone because the salt mining area is found within its boundary and is under its administration. From the woreda's total of nine

kebeles, we selected Berhale kebele, which has the highest number of salt transporters. The kebele has a total of five *kushets* (villages). We randomly selected and interviewed 250 households from the five *kushets*, including 115 (46 per cent) camel owners and 135 (54 per cent) camel non-owners.

## 2.4 Statistical analysis

We used statistical analysis to analyse households' socioeconomic and demographic characteristics (Table 1).

We also used statistical analysis to calculate:

- the proportion of profit earned by salt transporters
- the returns from camel salt transportation service, and
- its contribution to the national economy through tax revenues and employment.

Table 1. Households' socioeconomic and demographic characteristics

VARIABLE (HOUSEHOLD HEAD)	CATEGORIES	FREQUENCY	(% OF THE TOTAL SAMPLE)
Sex	male	230	92
	female	20	8
Literacy	literate	60	24
	illiterate	190	76
Religion	Muslim	250	100
Marital status	married	239	95.6
	unmarried	11	4.4
Access to credit	yes	43	17.2
	no	207	82.8
Residence type	permanent	201	80.4
	temporary	49	19.6
Camel ownership by parents	yes	80	32
	no	170	68
Status of camel holdings overtime	decreasing	53	46.1
	constant	41	35.6
	increasing	21	18.3

Source: Own survey data 2013

To do this, we analysed operating costs and profits for each participant in the salt value chain. In the profit analysis, we considered all monetary revenues and costs. If we can calculate the total profit of the salt trade value chain by adding up the profits gained by each participant, we can calculate the proportion of profits retained by a particular class of participants as the ratio of the participants' profit to the total profit made by all salt trade value chain participants.

## 2.5 Econometric analysis

To explore the impact of camel transportation sector activity on the livelihoods of camel-owning pastoral households, we use three types of econometric estimation models (after Gujarati 2004):

- likelihood of household camel ownership
- contribution of the camel salt transportation service to camel owners' livelihoods, and
- determinants of camel-owning households' camel rent decisions.

### 2.5.1 Likelihood of household camel ownership

We used a logit model to estimate the binary variable – households' probability of camel ownership – which took a value of one if the household was a camel-owning pastoral household and zero if the household did not own camels.

The logit model was specified as:

$$P(X_i) = P(\text{camel\_ownp} = 1 | X_i) = F(\beta_0 + \beta_i X_i + \varepsilon)$$

We used propensity score matching to assess the impact of camel ownership on household characteristics. The propensity score is a single-index variable which summarises the pre-treatment characteristics of each household. We used the maximum likelihood method to estimate the parameters of interest.

### 2.5.2 Impact on camel owners' livelihoods

Households that own camels used for salt transportation form the **treated** group. This includes people who transport the salt themselves or rent their camels to others. Households that did not own camels

and did not transport salt by renting camels from other camel owners form the **control** group. We estimated the livelihood impact of camel salt transportation by matching how the livelihood indicators differed for camel owners relative to observationally similar camel non-owners. We did this by matching the two groups of households on the basis of predicted propensity scores (after Becker and Ichino 2002).

For camel owners, the counterfactual is their livelihood condition in the absence of their camel ownership. For camel non-owners, the counterfactual is their livelihood condition if they moved to camel owner status. We compared camel owner and non-owner households that were as similar as possible in their observable characteristics (Rosenbaum and Rubin 1983).

In the case of a binary treatment, the treatment indicator  $T$  equals one for camel-owning households and zero otherwise. The potential outcomes – income, livestock ownership and fixed asset formation – are then defined as  $Y(T)$ . Income is a continuous variable which refers to the household's total annual income. This was the sum of all household members' income from waged employment, business activities, migration, and livestock and livestock by-product sales. We did not include income from agricultural output since none of the sampled households own any land.

We estimated the average treatment effect on the treated (ATT) as:

$$ATT = E(ATT | T = 1) = E[Y(1) | T = 1, P(X)] - E[Y(0) | T = 0, P(X)]$$

Therefore, where assignment to treatment is random, ATT is the mean difference in outcomes of the two groups of households which are as similar as possible in the group.

We used four different matching algorithms (nearest-neighbour matching, kernel matching, radius matching and stratification matching) to match the camel owner and camel non-owner households. These involve trade-offs in terms of bias and efficiency. Since none of the algorithms is superior to the others, their joint consideration offers a way to assess the robustness of the estimates. With all these methods, the quality of the matches may be improved by imposing the common support restriction (Lechner 2001). Hence, in this analysis, we imposed the common support restriction and described the joint estimation result of the four algorithms.

Table 2. Summary statistics of variables

VARIABLE	COMBINED				CAMEL OWNERS	
	MEAN	STANDARD ERROR	MIN	MAX	MEAN	STANDARD ERROR
Sex of household head	.92	.0172	0	1	.9478	.0208
Age of household head	37.296	.5399	20	68	37.496	.7788
Household size	4.752	.0967	1	10	5.026	.1515
Marital status of household head	.956	.013	0	1	.9652	.0172
Education level, household head	.24	.0271	0	1	.1739	.0355
Number of adult members of the household	2.936	.0866	1	8	3.0348	.1435
Number of male adult members of the household	1.592	.06004	0	6	1.6348	.0919
Adult ratio for the household	1.2976	.0507	0	6	1.2353	.0645
Dependency ratio for the household	.3649	.014	0	.75	.3914	.0194
Employment for wage	.472	.0316	0	1	.3478	.0446
Access to credit	.172	.0239	0	1	.2	.0375
Camel ownership by parents of household head	.32	.0296	0	1	.5826	.0462
Residence type	1.2143	.0367	0	1	1.2174	.0386
Number of camels owned by household	2.628	.235	0	20	5.713	.3277
Years the household head spent renting out camels to other salt transporters	8.228	.7335	0	50	17.887	1.0194
Annual household income	29883.62	2357.54	0	395700	35984.92	3956.013
Tropical livestock unit of a household	4.9745	.319	0	29.6	8.642	.4832
Value of fixed assets	36026.2	3652.61	0	791400	32410.17	2551.519

(continues)

Table 2. Summary statistics of variables (continued)

VARIABLE	CAMEL NON-OWNERS		DIFFERENCE		T-TEST	PEARSON CHI2(1)
	MEAN	STANDARD ERROR	MEAN	STANDARD ERROR		
Sex of household head	.8963	.0263	-.0515	.0344		2.2404
Age of household head	37.1259	.7503	-.3697	1.085	-0.3407	
Household size	4.5185	.1212	-.5076	.1918	-2.6462***	
Marital status of household head	.9482	.0192	-.0171	.0261		0.4301
Education level, household head	.2963	.0395	.1224	.0539		5.0993**
Number of adult members of the household	2.8519	.1038	-.1829	.1737	-1.0529	
Number of male adult members of the household	1.5556	.0792	-.0792	.1206	-0.6569	
Adult ratio for the household	1.3501	.0759	.1149	.1017	1.1297	
Dependency ratio for the household	.3424	.0197	-.04898	.0279	-1.7573*	
Employment for wage	.5778	.0427	.22995	.0619		13.1762***
Access to credit	.1482	.0307	-.0519	.04797		1.1724
Camel ownership by parents of household head	.0963	.0255	-.4863	.0508		67.4937***
Residence type	1.1818	.12197	-.0356	.1305		0.0755
Number of camels owned by household	0	0	-5.713	.3023	-18.8978***	
Years the household head spent renting out camels to other salt transporters	0	0	-17.887	.9405	-19.0179***	
Annual household income	24686.21	2710.32	-11298.71	4685.15	-2.4116**	
Tropical livestock unit of a household	1.8504	.1502	-6.792	.4747	-14.3088***	
Value of fixed assets	39106.52	6406.09	6696.35	7331.15	0.9134	
Difference = mean (camel non-owners) – mean (camel owners)						

Source: Own survey data 2013

## Sensitivity analysis

Propensity score matching cannot control for unobservable characteristics. It can only control the observed variables included in the propensity score that was used to match the two groups of households (Rosenbaum and Silber 2001, Caliendo and Kopeinig 2005 and 2008). This raises a question as to whether the obtained superior livelihood level of camel owners was due to their camel ownership or to other unobserved characteristics. Before interpreting the baseline estimate as evidence of a true causal effect of the treatment, sensitivity analysis can test the presence of unobserved variables (Rosenbaum 2002). We used sensitivity analysis to assess whether and to what extent the estimated average treatment effects were robust to possible deviations from the conditional independence assumption (based on Nannicini 2007). In general, the results of the analysis confirmed the robustness of the matching estimates (see full results and further discussion in: Araya, 2014).

## 2.5.3 Determinants of camel-owning households' camel rent decisions

Households make independent and varying decisions whether or not to participate in salt transportation. Some of them decide to **always** rent out their camels to other salt transporters and never transport salt themselves; some of them **sometimes** rent out their camels because they sometimes transport salt themselves; and some **never** rent out their camels. We modelled the probabilities of households' choices among these three options using an ordered multinomial choice model (ordered probit model) (after Schmidheiny 2007). This identified changes in the probabilities of given choices associated with changes in independent variables.

# Results

# 3

### 3.1 Contribution to the national economy

Tax is the Ethiopian government’s major source of revenue. All residents of the country pay tax for the income they earn. The transporters also pay salt tax to the government for each salt block they transport. They pay it before they go to the salt mining area. The amount of tax an individual transporter pays depends on the number and size of the camels that he takes to the salt mine. The tax is levied at 13 birr (US\$0.70) for a young camel, 17 birr (US\$0.90) for a medium camel and 22 birr (US\$1.17) for an adult.<sup>1</sup>

An average of 3,000 camels transport salt from the mining area to the market every day in the eight salt mining months (mid-September to mid-May): about 1,000 young, 1,000 medium and 1,000 adult camels. This indicates an daily average of 13 birr \* 1,000 + 17 birr \* 1,000 + 22 birr \* 1,000 = 52,000 birr (around US\$2,765) a day. We multiply this by 30 to get 1,560,000.00 birr a month. If we then multiply this by the salt mining eight months we estimate that the government collect 12,480,000 birr (about US\$ US\$663,000) per year from the salt transporters in salt tax.

### 3.2 Employment in camel salt transportation

The salt passes through the hands of seven main salt trade value chain participants before reaching the final consumers (Table 3). To estimate how many livelihoods were supported by the salt mine due to the driving force

of the camels salt transportation services, approximate minimum numbers of each type of participants were calculated.

In the salt mining area, there are more than 4,000 full-time workers who mine the salt layers and shape it into blocks.

The exact number of salt transporters is not known. However, on average, 3,000 camels per day carry salt to the market centre from the mining area. Each salt transporter brings an average of seven camels a time. So we worked out the average number of salt transporters as:

$$\frac{3,000}{7} = 429 \text{ a day or } 429 \times 30 = 12,870 \text{ trips a month}$$

A transporter moves salt on average three times a month, so the average number of full-time salt transporters is:

$$\frac{12,870}{3} = 4,290 \text{ transporters}$$

There are around 450 full-time daily workers around the market who unload the salt from the camels’ backs, count and layer it in the store and heap the salt onto wholesalers’ vehicles when they come to buy salt from the store.

The salt store serves as a market where the salt transporters sell their salt. It is owned by around 4,234 individual shareholders and has 34 employed workers. The store owners’ cooperative, called the Assaele Salt Trade Cooperative, was established in September 2010. Shareholders must be resident in the woreda and can buy a minimum of 1,000 and maximum of 10,000 birr in shares.

Table 3. Salt trade value chain participants

1	The <b>salt miners</b> extract the salt from the mine in the form of layers
2	The <b>salt shapers</b> shape the extracted salt layers into blocks, heap and pack it onto camels
3	The <b>salt transporters</b> transport it from the salt mining area to the market place by camel
4	Once the camels arrive at the market, the <b>salt off-loaders</b> unload it from the back of the camels, count and layer it in the store
5	The <b>salt store owners</b> sell it in bulk to wholesalers, who came from other places, usually Mekelle
6	The <b>salt wholesalers</b> sell it to retailers
7	The <b>salt retailers</b> deliver it to the consumers

<sup>1</sup> Exchange rate US\$1=18.81 birr from October 2013 (www.oanda.com). This exchange rate can be applied to all costs mentioned in this report.

The wholesalers are individual traders who sell the salt to retailers in bulk. There are around 150 wholesalers, mostly from Mekelle. Each has a car and a driver. There are too many retailers to quantify.

Overall, the camel transportation service has created full-time jobs for 4,290 salt transporters. Other people who rely on the service include 4,000 salt miners and shapers, the 34 store workers and 450 unloaders. So we estimate that salt transportation supports 8,774 livelihoods in total. We have not included the wholesalers and retailers, since they are not directly linked to the salt transporters. Nor have we included the salt store owners because, unlike the employees, they are not directly involved in these activities.

### 3.3 Total profits in the salt trade value chain

For the sake of simplicity, we have calculated the revenue, cost, profit and profit percentage share of salt trade value chain participants for a single adult camel carrying a full load of geleo (the biggest sized) salt blocks (see Table 4).

From this analysis, it is clear that the salt transporters are the main beneficiaries of the salt mine, taking 41.9 per cent of the total profit. The distribution of profits among the value chain participants indicates

inequalities and the relative advantage conferred by camel ownership.

The camel owners and transporters cover the costs relating to the salt and the camels, including salt tax, payments to the salt miners, shapers, off-loaders and fodder expenses.

### 3.4 Returns from the camel salt transportation service

The average price of an adult camel in the Afar region is 20,000 birr. If a household has 20,000 birr, it can either buy a camel and use it for salt transportation or save the money in a bank and earn interest.

If the household decides to buy a camel and use it for salt transportation, the camel can transport salt on average three times a month for eight successive salt-transporting months a year. In a single journey, an adult camel provides a net profit of around 258.60 birr, without taking into account annual costs for the camel. So we can work out the monetary value of a camel's salt transportation service as:

$$258.60 \text{ birr} \times 3 \times 8 = 6206.40 \text{ birr a year}$$

Table 4. Revenue, cost, profit and profit percentage share of salt trade value chain participants

SALT TRADE VALUE CHAIN PARTICIPANTS	REVENUE PER CAMEL (BIRR) (a)	COST PER CAMEL (BIRR) (b)	PROFIT PER CAMEL (BIRR) (a-b)	PROFIT PERCENTAGE SHARE PER CAMEL (%) $\left(\frac{a-b}{617.9} * 100\right)$
Salt miners	23.00	0.00	23.00	3.7
Salt shapers	88.00	0.00	88.00	14.2
Salt transporters	396.00	137.40	258.60	41.9
Salt off-loaders	4.40	0.00	4.40	0.7
Salt store owners	440.00	410.70	29.30	4.8
Salt wholesalers	616.00	555.45	60.55	9.8
Salt retailers	770.00	616	154.00	24.9

Source: Own computation 2013

## Costs

Pastoralists measure fodder in units called *daka* (1 *daka*=10kg). One camel consumes on average half a *daka* of fodder a day. So we calculated the cost of fodder as follows:

$$\frac{1}{2} \times 30 \times 12 = 180 \text{ daka per camel a year}$$

The average price of a *daka* of fodder is 14 birr, so feeding one camel costs 2,520 birr a year.

We found that water and veterinary service expenses were almost zero. The salt transporters do not usually hire other people to help them transport the salt. One male adult person can manage the activity, so there is no labour cost incurred. So the camel salt transportation service could earn a total net income of:

$$6206.40 \text{ birr} - 2520.00 \text{ birr} = 3686.40 \text{ birr}$$

A camel returns its price to its owner after five years and six months' work, and can continue generating profit for the rest of its lifetime. The average life expectancy of camels is 40–50 years.

If the household instead decides not to buy a camel but save the money in a bank at an interest rate of 5 per cent, at most they will earn 972 birr in interest after tax. This is much less than they would earn from owning a camel. It would take 20 years to earn 32,544 birr in interest from the bank. If the camel is properly herded and used for salt transportation it could earn more than this in half the time (less than nine years). So we conclude that a household will be better off buying a camel and using it for salt transportation rather than saving their money in a bank and collecting interest.

But owning camels has a higher risk than banking. Transporting salt is a difficult task which can be tiring for the salt transporter and will affect the maintenance of the camels. Even so, when we asked camel owners and focal persons about the effect of salt transportation on the camels, they said that "salt transportation doesn't have any negative effect on the health and maintenance of camels. Rather, they act mad and abnormal if they stop the activity. They only feel healthy and strong when they work." Normally, camels will spend two weeks a month working, followed by two weeks' rest.

## 3.5 Factors affecting household decisions

Out of the total 115 camel-owning pastoral households, 86 (74.8 per cent) households had experience of transporting salt and 19 also had experience of renting out camels in addition to transporting salt. But the remaining 29 (25.2 per cent) households had never been directly involved in salt transportation, and always rented their camels out to other salt transporters.

We observed a positive and significant difference in livelihood indicators, income and livestock ownership between households that owned camels and households that did not. There was a minimum of 6.5 TLU ownership and 10,000 birr (US\$532) annual income difference between the two groups of households, but we did not observe any effect on fixed asset value, because they did not use the income to build the household's fixed assets.

The following variables affected the likelihood of camel ownership:

**Sex of household head:** Camel ownership is 28.3 per cent higher among male-headed households compared to female-headed households, holding other variables constant.

**Age of household head:** A one-year increase in the age of the household head decreases their likelihood of camel ownership by 1.1 per cent, keeping the other variables constant. This is because as a household head gets older, his/ her managerial ability and physical capability decreases. Older household heads usually distribute their camels among their married children.

**Literacy of the household head:** Being literate decreases the likelihood of owning camels by 18.1 per cent because literate household heads prefer to be employed for wages rather than doing fatiguing activities such as camel production.

**Camel ownership of parents of the household head:** One of the decisive factors on whether a household owns camels or not. Household heads with camel-owning pastoralist parents have a 56.4 per cent higher likelihood of owning camels than household heads with parents who do not own camels. This is due to their higher probability of getting camels from their parents as a gift or inheritance, keeping other variables constant.

**Number of adult members in a household:** This had a statistically significant and positive marginal effect. Holding other variables constant, for each additional adult in the household, the likelihood of camel ownership increased by 7.9 per cent.

In general, male-headed households and those with young and illiterate household heads, camel-owning pastoralist parents, and a large number of adult members are more likely to own camels than their counterparts.

The literacy of the household head and number of camels owned by the household are the only two variables that have a significant effect on households' camel-renting decisions. We found that the other variables mentioned above had an insignificant effect on such decisions.

**Literacy of the household head:** The marginal effect of this variable is positive and statistically significant. A marginal effect of .170 implies that literate camel-owning household heads were 17 per cent more likely to always rent out their camels to other salt transporters, keeping other variables in the model constant. This is because literate household heads do not want to participate in salt transportation due to its tiring nature. So we conclude that literate household heads are more likely to rent out their camels than their counterparts.

**Number of camels owned by the household:** This variable had a negative and significant (even at 1 per cent) effect on households' camel rent decisions. The marginal effect of the variable implies that a one unit increase in the number of camels owned by a household decreases the likelihood of always renting out camels to other salt transporters by 3.2 per cent, keeping the other variables used in the model constant. This means that, if a particular household head has only a few camels, he/she would prefer to rent them out to other salt transporters rather than renting additional camels to make up a full team.

# Discussion and recommendations



Our study observed that camels play an important role in the livelihood and survival of pastoral households, creating employment and contributing to the national economy. But many camel-owning households observed that the number and productivity of camels decreases over time. Frequent causes of loss of camels include recurrent drought (shortage of food, water and pasture), disease leading death and rustling on camel journeys.

Drought is a natural cause, and while difficult to avoid altogether, the effects of drought can be reduced. Disease and rustling can be avoided with some effort. Disease prevalence can be reduced by improving access to veterinary services. The government has been providing security services to tackle rustling, but this has not eradicated the problem. To ensure optimal production and the sustainability of the trade, existing security arrangements should be strengthened and sustained.

The salt mine has created full and part-time jobs for many individuals who participate in the different salt trade value chain stages. This study demonstrates that salt transporters benefit the most, retaining 41.9 per cent of all profits. This reflects the larger proportion of risks that are borne by the transporters. The presence of the salt transporters is vital for the other salt trade value chain participants whose livelihoods depend on the salt mine. If the camels do not transport the salt from the mining area to the market, the salt miners and shapers will not have a buyer for their salt and the salt store owners, and indirectly the wholesalers, retailers and final consumers would not have a salt supplier. Also, it is the salt transporters who pay the miners, shapers and daily workers who unload the salt from the camels.

Since camel renters are enablers of income generation for the grooms who rent camels from them, they are positioned as credit-granting institutions (lenders). Eventually, the groom can earn sufficient funds to build up his own team of camels.

Further research could identify the extent to which the chain may build in opportunities for participants to change roles, progressing from loaders to transporters to wholesalers and retailers. If there is not any possibility of movement, and some actors remain continually marginalised, the government and other concerned bodies could consider measures to ensure that the benefit from the salt mine is more fairly distributed among participants.

Despite the fact that the salt mine impacts the livelihoods of the salt trade value chain participants in particular and the national economy in general, the salt mining area is managed and administered by the customary laws of society. The government makes no legal provision for the administration of the area. However, should the government decide to intervene in administering the area, it would be useful for it to fully understand the nature and use of the resources that are there.

# Conclusions

# 5

This study offers some evidence about the camel salt transportation service and its impact on the livelihoods of camel-owning households in Afar Regional State, Ethiopia.

The contribution of camels' salt transportation services to the national economy includes creating full-time jobs for about 8,774 individuals and contributing around 12,480,000 birr (about US\$663,000) a year to government revenue in the form of salt tax. This affirms the importance of salt in general, and the camel salt transportation service in particular, to the economy of the country.

Any national policy or development intervention aimed at improving the livelihoods of pastoral societies in the Afar region should take into account the social and economic contribution of camels, particularly their transportation services. The challenges observed through this study include security, camel health and access to credit to build up the herds. Interventions succeeding to address these constraints could further increase the contribution made by the camel salt transportation sector to the national economy.

# References

- Adugna, A (2014) Afar. Ethiopian Demography and Health. See [www.ethiodemographyandhealth.org/AFAR.pdf](http://www.ethiodemographyandhealth.org/AFAR.pdf)
- Araya, S T (2014) The impact of camel transportation on the livelihood of pastoralists: in Behahle woreda, Afar Regional State of Ethiopia. A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Economics, Mekelle University. See <http://tinyurl.com/qevy4hh>
- Becker, S O and Ichino, A (2002), Estimation of average treatment effects based on propensity scores. *The Stata Journal* Number 4: 358–377.
- Caliendo, M and Kopeinig, S (2005) Some practical guidance for the implementation of propensity score matching. Discussion paper no 1588.
- Caliendo, M and Kopeinig, S (2008) Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys* 22(1): 31–72.
- Central Statistical Authority (2007) Census.
- Guinand, Y (2000) Afar pastoralists face consequences of poor rains: rapid assessment mission. UN-Emergencies Unit for Ethiopia.
- Gujarati, D N (2004) Basic econometrics. Fourth edition. The McGraw–Hill Companies.
- Heanving, Q and Zhongmin, L (nd), *Camel trains in the desert*.
- Ichino A *et al.* (2007) From temporary help jobs to permanent employment: what can we learn from matching estimators and their sensitivity? *Journal of Applied Econometrics* 23: 203–327.
- Lechner, M. (2001). A note on the common support problem in applied evaluation studies. Discussion paper 2001–01. Department of Economics, University of St Gallen.
- Nannicini, T. (2007) A simulation-based sensitivity analysis for matching estimators. Universidad Carlos III de Madrid.
- Rosenbaum, P (2002) *Observational studies*. Springer, New York.
- Rosenbaum, P R and Silber, J H (2001) Matching and thick description in an observational study of mortality after surgery. *Biostatistics* 2: 217–32.
- Rosenbaum, P R and Rubin, D B (1983) The central role of the propensity score in observational studies for causal effects, *Biometrika*, vol 70, no: 41–55.
- Sandford, S (2006) Too many people, too few livestock: the crisis affecting pastoralists in the Greater Horn of Africa. Thesis.
- Schmidheiny, K (2007) Multinomial choice (basic models). Lecture notes in micro econometrics. Universitat Pompeu Fabra. See <http://kurt.schmidheiny.name/teaching/multinomialchoice2up.pdf>
- Schwartz, H J (1988) The potential of the camel (*camelus dromedarius*) as a transport and draught animal.
- Sintayehu, G *et al.* (2010) Diagnostic study of live cattle and beef production and marketing constraints and opportunities for enhancing the system.

# Related reading

Bassa, Z and Woldeamanuel, T (2015) Value chain analysis of the cattle trade in Moyale, southern Ethiopia: an economic assessment in Oromiya Regional State. Country Report. IIED, London. <http://pubs.iied.org/10121IIED.html>

Elhadi, Y A and Wasonga, O V (2015) Economic and nutritional contribution of camel milk in northern Kenya: a field study in Isiolo County. Country Report. IIED, London. <http://pubs.iied.org/10125IIED.html>

Gebremedhin, G G and Tesfaye, Y (2015) Market chain analysis of live goats: Asaita district, Afar Regional State, Ethiopia. Country Report. IIED, London. <http://pubs.iied.org/10120IIED.html>

Gituku, B C, Wasonga, O V and Ngugi, R K (2015) Economic contribution of the pastoral meat trade in Isiolo Town, Kenya. Country Report. IIED, London. <http://pubs.iied.org/10124IIED.html>

Hesse, C and MacGregor, J (2006) Pastoralism: drylands' invisible asset? Developing a framework for assessing the value of pastoralism in East Africa. Dossier n. 142. IIED, London. <http://pubs.iied.org/12534IIED.html>

Iruata, M N, Wasonga, O V and Ngugi, R K (2015) Economic contribution of the pastoral meat trade in Isiolo County, Kenya: findings from Oldonyiro and Garbatulla Towns. Country Report. IIED, London. <http://pubs.iied.org/10126IIED.html>

Kebede, S, Animut, G and Zemedu, L (2015) Contribution of camel milk to pastoralist livelihoods in Ethiopia: an economic assessment in Somali Regional State. Country Report. IIED, London. <http://pubs.iied.org/10122IIED.html>

Krätli, S (2014) If not counted does not count? A programmatic reflection on methodology options and gaps in total economic valuation studies of pastoral systems. Issue paper. IIED, London. <http://pubs.iied.org/10082IIED.html>

Mwaura, M W, Wasonga, O V, Elhadi, Y A M and Ngugi, R K (2015) Economic contribution of the camel milk trade in Isiolo Town, Kenya. Country Report. IIED, London. <http://pubs.iied.org/10123IIED.html>

Wako, G (2015) Economic value of camel milk in pastoralist communities in Ethiopia: findings from Yabello district, Borana zone Country Report. IIED, London. <http://pubs.iied.org/10119IIED.html>





This is one of a series of reports synthesising the findings of field research conducted by masters' degree students at Ethiopian universities who investigated the contribution of pastoral production to the national economy. The students developed the research to complement their degree studies, with support from the International Institute for Environment and Development and Tufts University.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them – from village councils to international conventions.



International Institute for Environment and Development  
80-86 Gray's Inn Road, London WC1X 8NH, UK  
Tel: +44 (0)20 3463 7399  
Fax: +44 (0)20 3514 9055  
email: [info@iied.org](mailto:info@iied.org)  
[www.iied.org](http://www.iied.org)

Funded by:



Knowledge  
Products